DEFENDING MASSACHUSETTS AGAINST BIOLOGICAL INVADERS

By Jay Baker, CZM

In the early 1980s, curators of tropical aquariums throughout Europe began to cultivate an alga imported from the Caribbean for use in tanks displaying tropical fish. This bright green, feathery alga called caulerpa (*Caulerpa taxifolia*) provided a brilliant backdrop for tropical displays, resisted wilting in the artificially lighted tanks, and grew vigorously in a wide range of temperatures. Caulerpa provided the perfect habitat for aquarium animals in the artificial aquarium environments. In 1984, a small patch—only about one square meter—of caulerpa was noted on a submerged flat under the windows of the Oceanographic Museum of Monaco on the Mediterranean Sea, likely discharged with wastewater from an aquarium display. Scientists soon noted the remarkable tendency of this alga to aggressively crowd out native plant and animal species. Its ability to spread by extending long stems, or rhizomes, which are toxic to most plants and fish, makes it a fierce competitor for space. The alga forms large, dense mats, uninhabitable by almost all other species. The rhizomes also cause caulerpa to be easily entangled in and transported with boat anchors and fishing gear, and by 1990 caulerpa had spread as far as 120 miles from its original point of introduction. In 1997, caulerpa covered a total area of 17-square miles, and by the spring of 2001, caulerpa, now commonly referred to as the "Killer Algae," had invaded the coastlines of six Mediterranean countries.

GOOD PETS CAN BE GREAT PESTS

The adaptable and aggressive characteristics of *Caulerpa taxifolia* and other invasive species are causing great concern not only in the Mediterranean, but also among scientists and natural resource managers across the globe, including those working here in Massachusetts. Many organisms that thrive in artificial or stressful environments, both plants and animals, are in high demand for use in home aquariums, water gardens, aquaculture operations, research facilities, or as bait for fresh or saltwater fishing. As a result, many of these species are transported for sale around the world. In fact, though it is now illegal to possess caulerpa in the United States, a brief search of the Internet will reveal a number of companies willing to deliver the "Killer Algae" right to your doorstep. In the summer of 2000, populations of caulerpa were discovered in two Southern California estuaries, both likely getting their start as a result of releases by aquarium hobbyists.

The very characteristics that make species like caulerpa so desirable for use in artificial environments also make them a great threat to the natural diversity of aquatic systems. Species transported beyond their native range and introduced to natural systems often have no competitors, allowing them to grow rampant and displace many or all native species. As a result, these invasive species are considered to be second only to human development in causing declines in the total number of species in the United States and worldwide. The explosive growth of invasive species also causes major conflicts with human uses of aquatic resources. These species often completely clog waterways and water intakes, making them unusable for recreational, municipal, or industrial purposes.

INVADERS IN MASSACHUSETTS

While Massachusetts has not yet had to deal with the presence of an invader like caulerpa, a number of other invasive species are well established, and many more are encroaching on the Massachusetts border. In the summer of 2000, a team of researchers from across the country, led by the Massachusetts Office of Coastal Zone Management, the Massachusetts Bays Program, and MIT Sea Grant, conducted a survey of invasive species along the coast of Massachusetts and Rhode Island (see *Coastlines* Winter 2000-2001). This Rapid Assessment Survey documented the presence of 24 introduced species and 49 cryptogenic species, or species whose origin could not be determined. While many of these species, such as the European green crab

A RESEARCHER REMOVES ATTACHED ORGANISMS FROM A FLOATING DOCK DURING THE RAPID ASSESSMENT SURVEY.

(*Carcinus maenus*), and the common periwinkle snail (*Littorina littorea*) were likely "hitchhikers" on international shipping vessels, several of these invaders are thought to have been introduced by recreational boaters or as escapees from aquariums, aquaculture operations, or research facilities. On the freshwater side, officials from Massachusetts Department of Environmental Management estimate that 50 - 70 percent of the public lakes and ponds in Massachusetts are infested with invasive plant species. Infestations by the likes of water chestnut (*Trapa natans*) and Eurasian watermilfoil (*Myriophyllum spicatum*) have rendered many Massachusetts lakes and ponds unusable for fishing, boating and swimming. Massachusetts state agencies spent more than $500,000 on the control of these species in 2001.

A COMMON SALT MARSH INVADER, PHRAGMITES AUSTRALIS OR COMMON REED.

TASK FORCE TAKES ACTION

Recognizing the need to stall the introduction of new invasive species, and minimize the spread of established invaders, a coalition of Massachusetts state agencies, federal officials, and area scientists began developing the *Massachusetts Aquatic Invasive Species Management Plan* in the fall of 2001. The Plan addresses invasive species concerns in both marine and freshwater environments, and includes actions such as monitoring estuaries throughout the Gulf of Maine for invasive species, creating a database of invasive species occurrences throughout the region, and training volunteers across the state to monitor for introduced plants and animals. (For more information on this planning effort, please visit www.mass.gov/czm/invasivemanagementplan.htm.)

WHAT YOU CAN DO TO STOP THE INVASION

Of highest priority in the Plan is the education of the general public, researchers, and industry representatives regarding their role in invasive species prevention. People who live near and utilize waterways for a variety of purposes—just about everyone—can play a part in limiting the spread of aquatic invaders. In many cases, introductions can be avoided by exercising minimal care in the use and handling of living aquatic organisms. The following are a few simple guidelines that can be followed to limit the spread of these species.

Proper Disposal of Home Aquarium Contents

Plants and animals used in both salt and freshwater aquariums should never be disposed of in a lake, stream, pond, estuary, or even in a municipal storm drain. Like caulerpa, plants and animals sold for use in these aquariums are often very hardy and aggressive, and many freshwater invasions across the country have been attributed to the release of aquarium plants. Plants and algae can also harbor unseen snails or other small invertebrates, which might become established in local waters. All unwanted aquarium plants, algae, and fish should be placed in a plastic bag and disposed of in the trash. Many researchers even recommend that aquarium plants be placed in a freezer for 24 hours prior to disposal, ensuring that they are unable to reproduce if they do come into contact with a local waterway. A few pet stores will accept unwanted aquarium plants and animals for disposal.

Choosing Plants and Animals for Your Water Garden

Outdoor water gardens are growing in popularity across Massachusetts as a centerpiece of residential landscapes. As with home aquariums, plants and fish used in water gardens are often selected because they grow well in stressful environments and require minimal care. Some of the most problematic aquatic invasive species in Massachusetts, such as purple loosestrife (*Lythrum salicaria*), can still be purchased in area nurseries. Because water gardens are usually outdoors and directly exposed to natural

environments, the escape of imported plants is not uncommon. Seeds or other reproductive components of plants can be transported by wind or wild animals such as birds and small mammals.

Before purchasing plants or seeds for use in water gardens (or any garden for that matter) find out if the plant is native to New England or a potentially invasive import. CZM is currently working on an Ecological Landscape Initiative, which will develop guidance for landscapers and homeowners on selecting native plants for use around the home, including wetland species that might be selected for water gardens (look for an update in an upcoming issue of *Coastlines*). In the meantime, lists of native plants can be obtained from the Massachusetts Division of Fisheries and Wildlife's Natural Heritage Program. If you are unsure of the origin of a plant, avoid buying it. Express your interest in purchasing native plants for use around your home to your local nursery.

Proper Disposal of Unused Fishing Bait

While the sources of fish used as live bait in Massachusetts are carefully regulated, the import of invertebrate species such as worms and crustaceans are not. Worms imported from Southeast Asia, for example, may comprise a portion of the marine live bait industry in New England. Surprisingly, many species used for bait are hardy enough to be sold live in coin operated vending machines! Of additional concern is the material in which the intended bait species are shipped. Often made up of seaweed or plant matter, the packaging itself may become a problematic invader, or harbor additional species not intended for use as bait.

While it may seem the humane thing to do, unused bait or bait packing materials should never be released into the water. Unused bait should be placed in a plastic bag or container and disposed of in the trash.

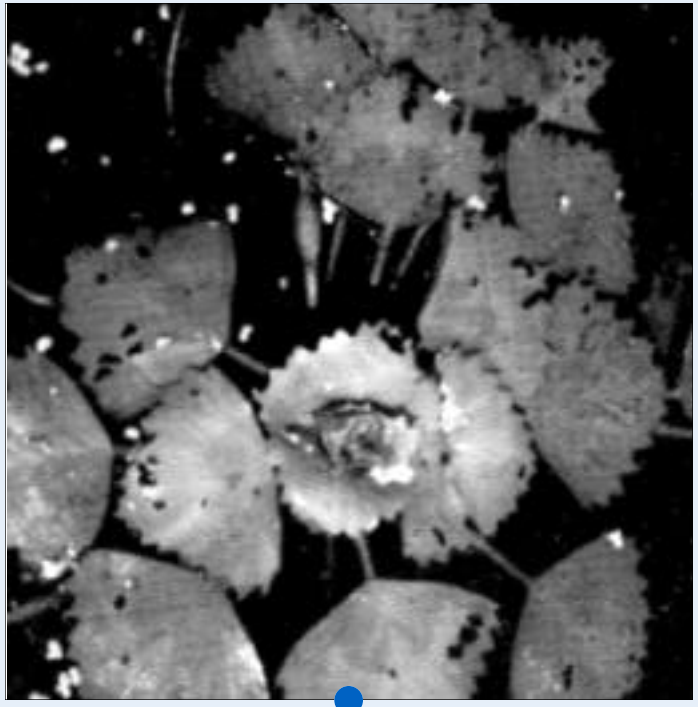
Thorough Cleaning of Boat Hulls, Engine Props, and Boat Trailers

Recreational boats and their trailers are likely the most common means of transport for invasive species between water bodies within New England and Massachusetts. Aquatic plants are easily entangled in engine props, anchors, boat trailers, and fishing gear. In many cases, the transport of just a fragment of a plant to an uninfested water body can allow for the generation of a thriving and damaging population. Likewise, boat hulls provide suitable habitat for a variety of invasive fouling organisms such as the notorious European zebra mussel (*Driessena polymorpha*), which has been sited in lakes only a few miles from the Massachusetts border.

Boat hulls, props, boat trailers, fishing gear, and other submerged components should be thoroughly cleaned before leaving a boat access. All animals and plant material should be disposed of in a trash receptacle as far from the water as possible. Likewise, water from bait buckets, motors, and other equipment should always be drained far from a water body. Animals, plant material, or water should never be released upon arriving at a new lake, pond, estuary, or any other water body.

Proper Disposal of Shellfish or Shellfish Waste

As with home aquarium contents, live shellfish or shellfish remnants should be kept clear of natural aquatic systems. Even shellfish harvested in Massachusetts can harbor invasive shellfish pathogens such as dermo (*Perkinsus marinus*) and QPX (quahog parasite unknown), which can linger in shells and other waste materials and cause significant mortality in economically important shellfish stocks. The Massachusetts Division of Marine Fisheries is also concerned about the intentional or unintentional introduction of European, Asian, and Pacific-Coast shellfish species such as the Asian clam (*Corbicula fluminea*) and the Pacific oyster (*Crassostrea gigas*). It is illegal to place any live shellfish in Massachusetts waters without a permit from the Division of Marine Fisheries, and shellfish waste should be disposed of in the trash.



THE WATER CHESTNUT (TRAPA NATANS) WAS INTENTIONALLY INTRODUCED TO THE U.S. AS A FOOD SOURCE. TODAY, DUE TO DRAMATIC PROLIFERATIONS, IT CLOGS LAKES, PONDS, AND RIVERS.

THE THREAT IS HERE AND NOW

Just this past fall, Massachusetts researchers made a discovery that underscores the need for a greater awareness of the invasive species issue in the state. Scientists from the University of Connecticut and the Massachusetts Department of Environmental Management found a potentially devastating invader called hydrilla (*Hydrilla verticillata*) in Long Pond on Cape Cod. Dubbed, the "Perfect Weed," hydrilla is one of the most aggressive invasive plants now present in the United States. Hydrilla is native to Asia where it coexists with other submerged plants and provides habitat for many aquatic organisms. In the United States, however, it quickly crowds out all other species, growing in thick mats that make recreational use of the infested pond impossible, and often impeding water movement to the point that it can cause flooding in infested areas. A common aquarium and water garden plant, hydrilla was first released in Florida, and now infests 43 percent of the public lakes and ponds in that state. With the recent addition of Massachusetts, hydrilla has now spread to 18 states across the country.

While no one is absolutely certain how hydrilla made it to Long Pond, the discoverers of the Perfect Weed suspect that it escaped from a water garden on the grounds of an area home. Though a less likely scenario, the hydrilla may also have been introduced by a boater who had recently visited an infested lake or pond in another state. Since its discovery, all boat ramps accessing the pond have been closed to prevent the spread of this species to other water bodies in the area, and Barnstable Town Officials are considering a herbicide application program estimated to cost as much as $60,000 in the first year, and almost certainly requiring follow-up applications in the following years.

Clearly, the introduction of hydrilla and the resulting impairment of Long Pond was not an intentional act. Regardless, eradication of this invader will likely require the investment of significant resources, and make the pond all but unusable over the next several years. Department of Environmental Management officials are also concerned that hydrilla may have already been spread to other ponds in the area.

A greater awareness of the invasive species issue would likely result in a significant decrease in the number of aquatic invasive species introductions in Massachusetts and across the globe. By exercising a few cautions, such as those listed above, Massachusetts could be spared the negative impacts of many encroaching invaders. For more information on the invasive species issue, and how to stop aquatic invasions, please visit the following web sites:

- www.anstaskforce.gov
- http://nas.er.usgs.gov
- www.cce.cornell.edu/programs/nansc/nan_ld.cfm

HYDRILLA OVERTAKES A FLORIDA LAKE.

THOUGH SMALL IN SIZE, CONTROL OF THE EUROPEAN ZEBRA MUSSEL SHOWN HERE COSTS THE U.S. HUNDREDS OF MILLIONS OF DOLLARS ANNUALLY.